in the hands of general practitioners, although I have no doubt that every educated physician can learn its proper use. At the present time it is best used by specialists. I can not agree that this is saying anything against the practitioner, any more than it is to say that the general practitioner should not attempt an oöphorectomy. I am sure that the general physician does not regard it as an attack on him when one advises that cases of surgery go to a surgeon, and at the present time it is the same thing with regard to the tuberculin test. In regard to what constitutes a reaction, if temperature alone is taken as an index, mistakes may be made. It is, of course, a part of the symptom-complex, and a most important part, but should be taken in connection with all other symptoms, subjective and objective. The diagnosis should not be made on any one particular symptom. The point made by Dr. Sachs is well taken. I have recently, in some experiments with tuberculin in the shape of ointment, observed a typical reaction in two men who were in the best of health, one of whom more than a year ago had a cutaneous tubercle. Neither of these men was a subject for sanitarium treatment. While these are special cases, there are many others who will give the tuberculin reaction but who are not fit subjects for sanitarium treatment.

Theoretically, the proposition was correctly stated by Dr. Knopf, that the climate which enables the patient to spend the greatest amount of time in the open air with least expense of vital force is the best one for the treatment of tuberculosis. Practically, this does not seem to hold true. I do not know of any place in any country where better results are obtained than at Saranac Lake, and yet it can not be called an ideal climate according to the standards laid down. I believe that there are certain patients who do better in a selected climate, but that most patients should be treated as near their homes as possible. Sending people hundreds of miles away from home without friends and without money is one of the most cruel things that can be done. More important than climate is the personality of the attending physician. The man who has his patients under strict discipline and who is able to inspire them with hope and courage is the man who gets the best results regardless of what the climate is.

Dr. Charles L. Minor, Asheville, N. C.: I admit that climate without care is almost useless, since the results obtained will be only temporary; but I also maintain that except in unusually favorable cases the best results are not likely to be obtained with care but without climate, and any one, by the use of a little thought, must realize, unless he is so prejudiced as to have his mind closed to conviction, that the combination of these two good things will give the best results.

Dr. S. A. Knopf, New York: About ten years ago, in my first book, I stated that to find the bacilli was absolute proof of the presence of tuberculosis and that not finding them did not exclude the possibility of a pulmonary tuberculosis. I stated distinctly this morning that, as a rule, we find the bacilli only when disintegration has taken place, but this should not be an excuse for not looking for them. I also have been misunderstood in regard to my attitude as to tuberculin. We have now some tuberculin test methods which are relatively free from danger, such as the skin method, the use of which may be justified in rare instances. After the patient's history has been taken and a careful physical diagnosis has been made, he should be informed of the consequences of the tuberculin test. His permission, and that of his family physician, and the approval of the practitioner's own conscience, should be obtained before making the test. How many of you would be willing to have 4 mg. of tuberculin injected into you without a previous physical examination justifying it as a last resort? I still plead with you not to neglect what our fathers have taught us, a careful taking down of the history, and a still more careful physical diagnosis.

Dr. Frank Smithies, Ann Arbor, Mich.: In the routine work of teaching physical diagnosis I have had ample opportunity of observing the effects of both the subcutaneous and the conjunctival reactions to tuberculin. I agree heartily with Dr. Knopf that no form of tuberculin test can take the place of accurate physical examination with the patient stripped. But there are many patients about whom, even after careful examination, one is in doubt. In these some variety of tuberculin test is indicated. I have faith in the ability of the general practitioner to make a reliable test with tuberculin subcutaneously administered, if the practitioner will only take the time to do so. In general practice the conditions are entirely different from those in hospitals or sanatoria, and as a consequence the details connected with the proper administration of tuberculin subcutaneously are more difficult to see to, and as a result the method does not always yield dependable information. I had these facts in mind when I took up the study of the conjunctival reaction, and my endeavor was to secure figures for a dependable and at the same time a conveniently carried out test. I am still inclined to the belief that where men have presented figures from sufficiently large series of cases the results have been favorable to the use of the conjunctival test. Of course, it is quite useless to compare the majority of the German reports with those from the French, inasmuch as in Germany there seems to be a prejudice against the test, largely on account of Calmette's name being associated with it. Then again, the tests have been made in Germany with a great variety of tuberculin preparations, many of which are now recognized as being unfitted for the work. I admit that here and there serious consequences have followed the conjunctival test. I called attention to four violent reactions in the work of Dr. Walker and myself this morning. I know of no case, however, in which such results have followed when the eyes were negative before the test was administered and were looked after following the instillation of the tuberculin. Regarding the different varieties of preparation used, I believe that when possible we should use tuberculin from human bacillus growths when testing human beings. In my opinion, the work of Detre with the cutaneous reaction seems to prove that more distinct manifestations are secured in tuberculous subjects when tuberculin from human bacillus growths are used, in preference to bovine bacillus growth tuberculin. I believe that many of the commercial tuberculin "discs" are not dependable.

THE DIAGNOSTIC VALUE OF THE CUTANEOUS AND CONJUNCTIVAL TUBERCULIN REACTIONS *

WILLIAM ENGELBACH, M.D.

AND

J. W. SHANKLAND, M.D.

ST. LOUIS

In endeavoring to arrive at definite conclusions as to the diagnostic value of the recent local tuberculin reactions, we have made a study of the literature on this subject to May 1, 1908, to which we have added the results of personal observations on 1,242 cases. The review of the literature includes the opinions of nine authors on their results with animal experiments; the reports of 41 authors on 5,032 cases of all ages subjected to these reactions, 3,477 to the conjunctival reaction and 1,546 to the cutaneous reaction. Our own investigations were made on adults only at the St. Louis City Hospital and the St. Louis University Medical School. They consist of 499 cutaneous reactions and 743 conjunctival reactions on 125 positive tuberculous cases, 190 suspect tuberculous cases, 700 other diseases not tuberculous clinically and 90 clinically normal individuals. The sum total of all cases considered is 6,305.

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* Read in the Section on Practice of Medicine of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.

* Owing to lack of space, the article is here abbreviated by the omission of the portions relating to technic and histology as well as some of the case reports and tables. The complete article appears in the Transactions of the Section and in the authors' reprints.

ANIMAL EXPERIMENTS

Lignieres[15] and Valle[16] produced positive conjunctival and cutaneous reactions in tuberculous cattle and horses, and constantly obtained negative reactions in these normal animals. Klemperer[17] observed only one negative cutaneous and conjunctival reaction in a series of tuberculous cattle. Positive reactions have been demonstrated by Valle[16] in tuberculous dogs and rabbits, and by Klemperer in guinea-pigs and dogs. Wildbolz's[18] autopsy findings in rabbits confirmed the value of these reactions. He obtained negative results with both these reactions in twenty normal rabbits which, with one exception, gave positive reactions to both tests six weeks after they had been inoculated in the bladder with tubercle bacilli.

Necker and Paschkis[19] report that the inoculation of animals has confirmed the value of the cutaneous reaction in tuberculosis of the genitourinary tract. In forty-two suspected cases of genitourinary tuberculosis in the human they had only one positive cutaneous reaction which was not substantiated by animal inoculation of urine. Notwithstanding the above favorable reports, a majority of the investigators have reported unsatisfactory results with these experiments. Arloing[20] observed in nineteen tuberculous animals (cats, goats, dogs, rabbits and guinea-pigs) a positive cutaneous reaction which could not be considered specific, however, because the identical reaction occurred in nine normal control animals.

Joannowics and Kapsammer[21] obtained negative results with both reactions in a large series of tuberculous guinea-pigs. Levi and Klopstock[22] did not obtain a positive conjunctival reaction in the series of tuberculous guinea-pigs and dogs. Vaccination of tuberculous guinea-pigs with from a 1 per cent. to a pure solution of tuberculin constantly gave negative results. One animal gave a positive conjunctival reaction and on postmortem no tuberculous lesion was found. One which had given a positive conjunctival reaction to a 1 per cent. solution was free of tuberculous lesions at autopsy. Wolff[23] did not produce positive reactions in tuberculous guinea-pigs or rabbits, although these animals gave positive reactions to the subcutaneous test. From these investigations one must infer that the results of this research have been so variable as not to aid the establishment of the specificity of these reactions.

POSITIVE TUBERCULOSIS

Cutaneous Reaction.—In 500 cases of positive tuberculosis, in patients between the ages of 5 and 14 years, von Pirquet reports 88 per cent. positive and 12 per cent. negative reactions. In a series of 143 cases (Table 1), of patients of all ages compiled of seven different authors, 70 per cent. gave positive reactions and 30 per cent. negative. In our own investigations of 55 cases (Table 10) 31 or 56 per cent. of the patients gave positive reactions, and 24 or 44 per cent. negative. A majority of our patients were in the third stage.

Conjunctival Reaction.—Of 1,572 cases by 30 different authors (Table 5) selected from the literature, 86 per cent. of the patients gave positive and 14 per cent. negative reactions. Schroeder and Kaufman[24] (Table 9) from a collection of 971 cases report that the patients in 88.5 per cent. gave positive and in 11.5 per cent. negative reactions. Our own results (Table 10) in the positive tuberculous cases with the conjunctival reaction was that of 70 patients 52 or 74 per cent. were positive and 18 or 26 per cent. were negative. The majority of these patients also were in the third stage. Wolff[23] found 30 per cent. of the patients in the first and second stages of tuberculosis reacted negatively to the conjunctival test and 37 per cent. negatively to the cutaneous reaction. Heinemann reports six cases of patients in the first and second stages of tuberculosis and Levi[22] four cases of patients not in the advanced or cachectic stages of tuberculosis (one of the kidney, one of the prostate, two of the knee-joint), which gave negative reactions. Webster and Kilpatrick[25] report cases of patients with beginning tuberculosis which gave negative conjunctival reactions. Mentoux[26] obtained negative conjunctival reactions in ten positively tuberculous children in the first stages of disease, MacLennan[27] obtained negative reaction in early tuberculosis (patients with hip disease in good condition and in two patients with phthisis which reacted positively to 10 mg. of tuberculin (O. T.) subcutaneously). Kleinberger[28] reports 7 negative and 2 doubtful reactions of 17 patients with not advanced tuberculosis.

SUSPECTED TUBERCULOSIS

Cutaneous Reaction.—in a series of 23 cases of children von Pirquet[1] reports 5 positive and 18 negative reactions. The patients in the 5 positive cases proved to be tuberculous and 15 of the patients in the negative cases were found to be free from tuberculosis at necropsy. In 195 cases of five authors (Table 2) 55 per cent. of the patients reacted positively, 44.5 per cent. negatively and in 0.5 per cent. the results were doubtful. In our own results (Table 11) of 55 patients with suspected tuberculosis other than pulmonary (arthritis, adenitis, peritonitis, meningitis, etc.) 30 or 55 per cent. reacted positively and 23 or 45 per cent. negatively. In 42 patients with clinical symptoms of pulmonary tuberculosis (Table 12) 28 or 67 per cent. reacted positively and 33 per cent. negatively.

Cutaneous Reaction.—In a series of 23 cases of chil- (Table 6) 48 per cent. of the patients reacted positively, 50 per cent. negatively and in 2 per cent. the reaction was doubtful. Schroeder and Kaufman[24] (Table 9) reported practically the same percentage, 51.4 per cent. positive and 48.6 per cent. negative. For our own results (Table 11) in 40 cases other than pulmonary 21 or 52 per cent. of the patients resulted positively and 19 or 48 per cent. negatively. Of 52 patients with the clinical symptoms of pulmonary tuberculosis 15 or 28 per cent. reacted positively and 38 or 72 per cent. negatively (Table 12).

OTHER DISEASES CLINICALLY NON-TUBERCULOUS

Cutaneous Reaction.—Of 252 cases in the literature (Table 3) 15 per cent. of the patients reacted positively and 85 per cent. negatively. In our own results (Table 14) in 268 cases 149 or 56 per cent. of the patients reacted positively and 119 or 44 per cent. negatively.

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[15] Semaine méd., 1907, p. 585.

[16] Acad. d. sc., May 27, June 17, 1907; Semaine méd., 1907, pp. 85, 309.

[17] Deutsch. med. Wchnschr., 1908, No. 4.

[18] Berl. klin. Wchnschr., March 16. 1907.

[19] Wien. klin. Wchnschr., March 5, 1908.

[20] Soc. de biol., June 22, 1907.

[21] Berl. klin. Wchnschr., 1907, No. 45.

[22] Berl. klin. Wchnschr., Feb. 3, 1908. Deutsch. klin. Wchnschr., No. 3, 1908.

[23] Berl. klin. Wchnschr., Feb. 10, 1908.

[24] München. med. Wchnschr., Jan. 14, 1908.

[25] Brit. Med. Jour., Dec. 7, 1907.

[26] French Congress for Internal Medicine, Paris, München. med. Wchnschr., Jan. 14, 1908.

[27] Brit. Med. Jour., Dec. 7, 1907.

[28] München. med. Wchnschr., Jan. 14, 1908.

Conjunctival Reaction.—From a total of 932 cases collected (Table 8) the reactions of the patients in 17 per cent. were positive and in 83 per cent. negative. Schroeder and Kaufman[24] (Table 9), on a basis of 627 cases, found the patients' reactions in 12.7 per cent. positive and in 87.3 per cent. negative. Our own results (Table 13), with 417 patients, gave 102 or 24 per cent. positive and 315 or 76 per cent. negative. Cohn[9] produced positive reactions in 38 per cent. of the cases of typhoid. Plehn[29] obtained positive reactions in 2 of 5 patients with typhoid, 2 of 5 patients with scarlet fever, 6 of 12 patients with articular rheumatism, 3 of 6 patients with acute bronchitis, and in 3 patients with enteritis. In none of these patients was there the slightest evidence of tuberculosis. In one case, a pregnancy complicated with pleurisy, a positive reaction occurred from a 1 per cent. solution, and in the other eye two weeks later a negative reaction occurred from a 2 per cent. solution. In a case of articular rheumatism the patient gave a positive reaction during the activity of the symptoms. The symptoms of rheumatism promptly subsided on the administration of salicylates, but two weeks later returned and, simultaneously, without installation, a marked conjunctival reaction recurred in the eye previously instilled. Reuschel[30] reports one case of a patient with leukemia (free from tuberculous lesions at autopsy), which gave a positive reaction. Blum[31] obtained 16 per cent. of positive reactions in non-tuberculous diseases. Fisen[32] observed positive reactions in 31 per cent. of various non-tuberculous infections. Serafini found that the ocular reaction is not conclusive in tuberculosis of the bone. The reaction was positive in certain gonorrheal, senile and other non-tuberculous articular affections.

CLINICALLY NORMAL INDIVIDUALS

Cutaneous Reaction.—Of 181 cases selected from the literature (Table 4) 91 or 50.2 per cent. of the patients gave positive and 49.8 per cent. gave negative reactions. The patients were of all ages. Burnet[13] reports positive cutaneous reactions in non-tuberculous people. Kleinberger obtained positive reactions in 16.6 per cent. of normal individuals. Stadelman[33] obtained positive reactions in 50 per cent. of adults. Warfield[34] reports 7 positive reactions in apparently normal individuals (1 in a 7-months-old baby and 6 in adults). von Pirquet[1] has found that in individuals from 10 to 14 years of age 55 per cent. and in adults 90 per cent. reacted positively. Freer obtained 35 per cent. of positive reactions in patients between the ages of 10 and 15 and Mainini[35] obtained positive cutaneous reactions six times more frequently than conjunctival reactions.

Conjunctival Reaction.—Of 351 cases selected from the literature (Table 8) 11 per cent. gave positive reactions and 88 per cent. negative and 1 per cent. doubtful. Smithies and Walker[36] obtained negative reactions in 70 apparently normal individuals. Webster and Kilpatrick[25] observed two positive reactions in four normal individuals. Mentoux[26] produced positive reactions in 16 children in only 3 of whom was there a slight suspicion of tuberculosis clinically. Stadelmann[33] obtained positive reaction in 16 per cent. of normal individuals. Baldwin[8] obtained 16 positive reactions in 57 normal individuals or a percentage of 28.

Our own results of clinically normal individuals were obtained from experiments on students of the St. Louis University. These students were apparently healthy and many of them were active athletes, such as football men. Of a total number of 90 patients (Table 14) subjected to these reactions 79 were given the cutaneous and 70 the conjunctival, the entire number not taking both reactions. Of 79 cutaneous reactions 41 or 51 per cent. were positive, 18 negative and 20 doubtful, or 49 per cent. negative or doubtful. In 70 of these the conjunctival reaction in 18 or 25.5 per cent. was positive, in 46 negative and in 6 doubtful, or 74.5 per cent., was negative or doubtful. In 63 of these students who volunteered to take both reactions at the same time, the following remarkable results were obtained: In 43 per cent. both reactions were negative or doubtful; in 19 per cent. both reactions were positive; in 33.3 per cent. the cutaneous was positive and conjunctival was negative; in 4 per cent. the cutaneous was negative and the conjunctival was positive; 57 per cent. reacted positively to either one or both; 52 per cent. gave positive cutaneous, and 23 per cent. positive conjunctival reaction.

Of the students who gave positive reactions six gave histories of either having tuberculosis in the family or of exposure to tuberculosis. In over twenty who were examined no clinical evidence of tuberculosis could be demonstrated. Two of the students who gave positive conjunctival reactions had chronic conjunctivitis. In three of the students conjunctival reactions were produced which required treatment. In one case a marked phlyctenular conjunctivitis, and in another edema of the eye-lid with a severe conjunctivitis occurred.

SUMMARY

We must agree with Smithies and Walker[36] that the failure of definite conclusions with regard to these reactions in the above cases is to a certain extent due to poor technic, difference in the tuberculin preparation, absence of more positive control than the clinical findings, indefinite standard of reactions and the presence of unknown conditions which modify or prevent these reactions. Whether or not all of the above difficulties will ever be satisfactorily overcome, from the present status of the accumulated report on these reactions in adults, we deduce the following marked inconstancy with regard to their value as diagnostic agents:

SUMMARY OF ALL CASES CONSIDERED

CUTANEOUS REACTIONS

	No. Cases.	Per c't. Pos.	Per c't. Neg.
I. PositiveTuberculosis.			
Seven authors (Table 1)	143	70	30
Engelbach and Shankland (Table 10)	55	56	44
II. Suspected Tuberculosis.			
Five authors (Table 2)	195	55	45
Engelbach and Shankland (Table 11)	190	61	39
III. Other Diseases.			
Five authors (Table 3)	252	15	85
Engelbach and Shankland (Table 13)	268	56	44
IV. Clinically Normal.			
Four authors (Table 4)	181	50	50
Kleinberger	...	17	83
Freer (10 to 15 years)	...	35	65
Stadelmann	...	50	50
Engelbach and Shankland (Table 13)	517	24	76
Pirquet (10 to 14 years)	...	55	45
Pirquet (Adults)	...	90	10

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29. Deutsch. med Wchnschr., Feb. 20, 1908.
30. München. med Wchnschr., Feb. 25, 1908. Reuschel quotes a case of leukemia reported by Escherich[67] in which there was a marked reaction to an injection of 4 mg. tuberculin (O. T.).
31. München. med. Wchnschr., Jan. 14, 1908.
32. Beitr. z. Klin. d. Tuberk., viii, No. 4.
33. München. med. Wchnschr., Jan. 14. 1908.
34. THE JOURNAL A. M. A., Feb. 29, 1908, l, 687; Interstate Med. Jour., March, 1908.
35. München. med. Wchnschr., Dec. 17, 1907.
36. THE JOURNAL A. M. A., Jan. 25, 1908, l, 259.

Conjunctival Reactions

	No. Cases.	Per c't. Pos.	Per c't. Neg.
I. PositiveTuberculosis.			
Thirty authors (Table 5)	1572	86	14
Schroeder and Kaufman (Table 9)	971	85.5	11.5
Engelbach and Shankland (Table 10)	70	74	26
II. Suspected Tuberculosis.			
Twenty-two authors (Table 6)	642	48	52
Schroeder and Kaufman (Table 9)	284	51	49
Engelbach and Shankland (Tables 11-12)	190	40	60
III. Other Diseases.			
Nineteen authors (Table 7)	932	17	83
Schroeder and Kaufman (Table 9)	627	13	87
Engelbach and Shankland (Table 13)	517	24	76
IV. Clinically Normal.			
Eight authors (Table 8)	351	11	89
Stadelmann	...	16	84
Engelbach and Shankland (Table 14)	79	25.5	74.5
Baldwin	70	28	72

In positive tuberculosis the negative cutaneous reactions have varied from 30 per cent. to 44 per cent., and the negative conjunctival reactions from 11.5 per cent. to 26 per cent. It has been conceded from the first that patients with advanced tuberculosis give negative reactions. The later reports, however, of Wolff, Levi, MacLennan, Kilpatrick, Klemperer and others prove that patients in the first and second stages of tuberculosis, in good condition, also frequently give both cutaneous and conjunctival negative reactions. Negative reactions in beginning tuberculosis have been reported in as high as 30 per cent. to 37 per cent. of the cases by Wolff.

In suspected tuberculosis there is a constant finding in the hands of different men of about 50 per cent. negative and 50 per cent. positive reactions. The positive reactions in these cases have varied from 40 per cent. to 48 per cent. with the conjunctival reaction, and 55 per cent. to 61 per cent. with the cutaneous reaction.

In other diseases not considered tuberculous clinically the percentage of positive reactions has varied from 15 per cent. to 56 per cent. with the cutaneous and from 13 per cent. to 24 per cent. with the conjunctival.

In clinically normal individuals there has been a wide range of difference with the positive reactions. These have ranged from 17 per cent. to 90 per cent. with the cutaneous reaction, and from 11 per cent. to 28 per cent. with the conjunctival reaction.

In comparing the table of cases selected from the literature one is struck with the same amount, practically, of positive reactions which occur in non-tuberculous diseases and clinically normal individuals. In comparing the suspected with the positive tuberculous cases compiled, the difference is not enough to warrant positive conclusions.

	Cutaneous. P.C. Pos.	Cutaneous. P.C. Neg.	Conjunctival. P.C. Pos.	Conjunctival. P.C. Neg.
Positive Tuberculosis	56	43	74	26
Suspected Tuberculosis (not pulmonary)	55	45	52.5	47.
Suspected Tuberculosis (pulmonary)	67	33	28	72
Other Diseases (non-tuberculous clinically)	56.5	43.5	24	76
Clinically normal individuals	51	49	25.5	74.5

In our own work, which is shown in the above table, the cutaneous reaction in the five conditions (positive tuberculosis, 56 per cent.; suspected tuberculosis, not pulmonary, 55 per cent.; suspected pulmonary tuberculosis, 67 per cent.; other diseases, 56 per cent.; clinically normal individuals, 51 per cent.) was practically the same percentage. Our cases of positive conjunctival reaction in suspected pulmonary tuberculosis (28 per cent.), other diseases non-tuberculous clinically (24 per cent.) and clinically normal individuals (25.5 per cent.) also occurred practically in the same relative number of cases.

Clinically Normal Individuals Subjected to Both Cutaneous and Conjunctival Reactions

	No.	Per Cent.
Individuals	63	..
Positive reactions	36	57
Positive cutaneous reactions	33	52
Positive conjunctival reactions	15	23
Positive cutaneous, negative or doubtful conjunctival	21	33
Positive conjunctival, negative or doubtful cutaneous	3	4

Furthermore, a perusal of the above table will demonstrate that these reactions are very variable in normal individuals, i.e., one reaction will be present in the absence of the other one without any definite relation or apparent cause for this variation. We have also observed this variance in known tuberculous cases and in other diseases not considered tuberculosis clinically.

LOCAL LESIONS OF THE EYE

It has already been established that a number of diseases of the eye, tuberculous and non-tuberculous, will in themselves give positive reactions and absolutely interdict the use of the conjunctival reactions. These conditions of the eye necessarily restrict the use of this reaction in a high percentage of cases. The lesions of the eye may be so slight as to be entirely overlooked by those not especially skilled in the diagnosis of eye diseases. It is probable that in two of our normal cases in which the patients gave positive eye reactions, that this reaction was due entirely to a slight chronic conjunctivitis which was not observed previous to the instillation. The above facts probably account for many of the positive reactions which are credited to non-tuberculous diseases.

THE SPECIFICITY OF OTHER TOXINS

In attempting to determine the specificity of tuberculin reactions it is necessary to consider the specific reactions of other toxins applied in this manner, especially those reactions produced or present in other diseases with tuberculin and the reactions produced in tuberculosis by other toxins.

Our own observations with the use of typhoid toxins in known tuberculous cases and other diseases (Table 15) are as follows: We instilled 78 patients with this toxin. Of 48 positive tuberculous patients 8 reacted positively in the first 36 hours. Only 2 of these reactions remained positive after the first 36 hours. None of these patients gave a history of typhoid. Of the 29 patients with other diseases not tuberculous, 1 reacted markedly and 2 gave mild reactions after 24 hours. None of these three patients had had typhoid. Among these cases, however, were three typhoid patients, of whom one gave a negative, and 2 gave slight reactions after 36 hours. We used in this series of typhoid toxin instillation 1 per cent. and 2 per cent. toxin furnished us by the Alexander Laboratory. This laboratory did not recommend the toxin on account of having some difficulty in providing a reliable one which actually contained typhoid toxin. The difficulty has been encountered by Orsvag and others who claim it is impossible to obtain typhoid toxin for this use on account of the toxins of typhoid being endotoxins.

We are led to conclude from the above that toxin reactions in general have not proved specific for the following reasons: 1. Tuberculin gives positive reactions in cases of typhoid fever; 2, typhoid toxin reactions have been demonstrated positive in tuberculosis; 3, the different toxins, typhoid, paratyphoid, colon and tuberculin have given positive reactions in the same case.

ACTIVITY OF THE LESION

Believing that both of these reactions are specific ones for tuberculosis, Wolff-Eisner, Mainini,[35] Stadelmann[33] and others maintain that they also indicate the activity and the extent of the lesion. They believe that a positive cutaneous reaction with a negative conjunctival reaction on the first instillation with a positive conjunctival reaction on the second instillation indicates a latent tubercular lesion. A positive conjunctival reaction at the first instillation is indicative of an active tuberculous lesion. Wolff-Eisner and Teichmann[57] draw definite conclusions from the onset, intensity and the duration of the cutaneous reaction to the activity of the lesion and the prognosis of the case. They have described the following three types of the cutaneous reaction:

Type 1.—The reaction begins 4 to 6 hours after vaccination, reaches its greatest intensity in 20 to 24 hours, as an elevated papule, 10 to 20 mm. in diameter, continuing thus throughout the second day, and gradually disappearing during the third and fourth day to a slight pigmented area for the course of 3 or 4 weeks. There are two varieties of this type, the "marked" and the "moderate." This type is taken to indicate incipient tuberculosis, and first and second stage of tuberculosis, of non-progressive type with a favorable prognosis.

Type 2.—This is a slight reaction characterized by rapid course of mild intensity. It begins about the sixth hour, rapidly reaches its acme, sometimes in 10 hours, when it is from 4 to 10 mm. in diameter, and rapidly disappears not later than the second day without pigmentation. It is said to occur in the third stage of tuberculosis, and in the first and second stages of unfavorable cases having a bad prognosis.

Type 3.—This is a late prolonged reaction. It begins as the other types, reaches its greatest intensity 8 to 10 mm. in diameter at the end of the second day, and persists unchanged for at least a week. It is taken to indicate latent tuberculosis.

The conjunctival reaction they say occurs only in Types 1 and 2, in varying degrees of intensity. They conclude that the cutaneous reactions show marked differences in intensity in the various forms of tuberculosis, depending on the lysis of the bacilli-débris, and the effect on the body of the toxins set free.

In contending against the value of the diagnosis of the activity of the lesion, as claimed above, we wish to join those investigators who disagree with these authors for the following reasons: 1. Animal experimentations have not confirmed their findings; 2, positive tuberculosis of the first and second stages have given both the conjunctival and cutaneous reactions in an inconstant manner, a negative cutaneous reaction, or negative cutaneous reaction with a positive conjunctival reaction; 3, the clinical course of cases giving these reactions has not borne out their predictions; 4, not enough absolute postmortem control has been observed to substantiate their theory.

Baginsky[58] reports negative cutaneous reactions in a child in good general condition who reacted positively to 1/5 mg. tuberculin (O. T.) subcutaneously. Wolff,[23] Heinemann,[59] Levi,[22] MacLennan[27] and others have shown that negative reactions occur in the first and second stages of active, but not cachectic, tuberculosis. Webster and Kilpatrick[25] have demonstrated that the conjunctival reaction occurred in clinically quiescent and non-quiscent tuberculosis. Mentoux[26] has shown that negative conjunctival reactions occur in beginning active tuberculosis, and that positive reactions were present in non-tuberculous children.

The clinical course on positive reactions has not borne out the prognostic value of the combined reactions as demonstrated by Heinemann,[59] who reports one case of tuberculous peritonitis which gave a negative reaction with a final recovery. He also reports a case of bilateral apical lesion which was treated for many months after negative reactions, and which gave later a positive reaction. Engel and Bauer[60] found 6 cases which gave positive cutaneous reactions, five of the patients were certainly free from tuberculosis, as proved in one case by postmortem, and in four cases by negative subcutaneous reaction.

Our own observations have demonstrated a marked variability of the occurrence and intensity of these reactions which we have not been able to explain upon the activity or extent of the lesion. The relationship of these reactions either in combination or the degree of intensity of the single reaction are so inconstant that we are inclined to believe with Reuschel[30] that the reactions demonstrate at most the presence of anti-tuberculous bodies and not tuberculosis. These antibodies depend more on the resistance of the body for their productions than the extent or activity of the infection. The variability of these reactions on this basis is consequently more easily explained. It is yet to be determined, however, whether the sensibility, demonstrated by these methods, is due to antibodies or to albuminous substanes in the serum.

PROGNOSTIC VALUE

The prognostic as well as the diagnostic value of these reactions have been affirmed by the majority of the investigators as more or less certain. Some have even claimed that a negative reaction in known tuberculosis indicates a very unfavorable prognosis, death occurring in the majority of these cases within ten days. The same contention would apply to these tests as has been given above, i. e., the questionable specificity of these reactions and the inconstant relationship of the activity and extent of the lesions to the intensity of the reaction. The presence of negative reactions in non-progressive tuberculosis of the first and second stage, as demonstrated by Wolff, Heinemann, Levi, Phlen and Mentoux, and the presence of a positive conjunctival reaction with a negative cutaneous reaction in clinically normal individuals, argue against this claim for these reactions. The clin-

DURATION OF LIFE AFTER REACTIONS IN POSITIVE TUBERCULOSIS

Days from reaction to death.	Reactions.	Positive (26)	Negative (26)
1 to 10	pos. 7	*b, a, b, a, b, b, a*	*b, d, b, d, a, b*
	neg. 11	....	*b, a, a, a*
10 to 20	pos. 5	*b, b, b, a, a*	*b, b, a, a, d, e*
	neg. 6	....	....
20 to 30	pos. 6	*b, b, b, b, b, c*	*e* (112 days)
	neg. 3	....	....
40 to 50	pos. 3	*b, b, a,*	*a, b*
	neg. 2	....	....
After 50	pos. 5	*a* (120 days) *c* (87 days)	*b* (69 days) *d* (59 days)
	neg. 4	*c* (128 days) *a, d, e*	*d* (83 days) *c* (71 days)
Total	52	*c* (68 days)	

(*a*, cutaneous reaction; *b*, conjunctival reaction; *c*, both reactions positive; *d*, both reactions negative; *e*, cutaneous reaction positive, and conjunctival negative.)

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[57] Berl. med. Wchnschr., Jan. 13, 1908.

[58] Berl. med. Wchnschr., June 3, 1907.

[59] München. med. Wchnschr., March 17, 1908.

[60] Berl. klin. Wchnschr., No. 37, 1907.

ical course and postmortem findings of cases subjected to these reactions have not borne out this significance of these reactions. Known tuberculous patients have given negative reactions and then been observed for a long time or cured as reported by Heinemann,[59] Sabrazes, Duperes[14] and others.

In our own work we had 52 patients who died after being subjected to these reactions (see above table). Twenty-six of the patients reacted positively and 26 negatively. Of those who died in the first ten days, after one or the other of these reactions, 7 reacted positively and 11 negatively. Of 11 patients who died in from 10 to 20 days after inoculation 5 reacted positively and 6 negatively. Ten patients died in from 20 to 30 days after inoculation, of whom 3 reacted negatively and 7 positively. Of 5 patients who died in from 40 to 50 days after inoculation, 3 reacted positively and 2 negatively. Nine patients lived for from 50 to 128 days after being inoculated; four of these reacted negatively and 5 positively. Three patients who were not considered tuberculous clinically, and on whom the postmortem findings were negative, gave positive reactions. One of these gave a positive cutaneous reaction 6 days before death. One gave a positive cutaneous and

TABLE 1.—CUTANEOUS REACTIONS.—POSITIVE TUBERCULOSIS

Author.	No. of Cases.	Age.	Reaction.		Control Diagnosis.	Reaction.		Control Diagnosis.
			Pos.	Per Cent.		Neg.	Per Cent.	
1. Pirquet[1]		5-14		88			12	
2. Olmer and Terres[70]	37		20			11		
3. Baginsky[58]	1	Child				1		Pos. to 0.5 and 0.2 mg. sub.
4. Wolf[23]	19	17 adults, 2 child.	12	63.2	First and second stage	7	36.8	First and second stages.
5. Reuschel[30]	28		10		Tuberculosis, 7 cases, autopsy; 6 + and 1 — subcutaneous.	18		20 of this number = + clinical findings and 8 were +
	14		14					
6. Necker and Paschkis[19]	19		19		Animal inoculation			
7. Bing[71]	19		14	73.7		5	26.3	
8. Warfield[34]	12	Adult	11			1		
	143		100	70		43	30	

TABLE 2.—SUSPECTED TUBERCULOSIS

Author.	No. of Cases.	Age.	Reaction.		Control Diagnosis.	Reaction.		Control Diagnosis.
			Pos.	Per Cent.		Neg.	Per Cent.	
1. Pirquet[1]	23	Child	5		Autopsy +	18		Autopsy, 15 negative.
2. Wolf[23]	90	5-13 23 adults.	47	52.2	27 of these suspect, 16 or 59.2 per cent. = + reaction; 25 or 92.5 per cent = +, 11 subcut. Pos. findings in 7 of above 27 by x-ray.	43	47.8	
3. Reuschel[30]	14		14		Pleuritis, serose, scrofula, clinical T. B. C.			
4. Bing[71]	36		25	69		11	31	
5. Warfield[34]	32	8-51	16			16		
Total	195		107	55		88	45	

TABLE 3

OTHER DISEASES, NON-TUBERCULAR

Author.	No. cases.	Reaction. Pos.	Reaction. Per cent.	Control Diagnosis.	Reaction. Neg.	Reaction. Pr. ct.	Control Diagnosis.
1. Pirquet[1]	16	..	16				
2. Olmer & Terres[70]	17	3	..		14	..	
3. Reuschel[30]	8	..	..	Autopsy leukemia..	7	..	Autopsy subcutaneous.
	18	1	..		18	..	
4. Necker & Paschkis[19]	23	1	..	Animal inoculation.	22	..	Animal inoculation.
5. Bing[71]	186	34	18.2		152	81.8	
Total	252	39	15		213	85	

TABLE 4

CLINICALLY NORMAL INDIVIDUALS

Author.	No. cases.	Reaction. Pos.	Reaction. Per cent.	Control Diagnosis.	Reaction. Neg.	Reaction. Pr. ct.	Control Diagnosis.
1. Pirquet[1]	..	..	35		..	65	
	..	..	2		..	98	
2. Engel & Bauer[60]	48	6	..	1 cut. T. B. C. 4— to subcut. test. 1 + to subacut.test.	42	..	
3. Baginsky[58]	19	12	..		7	..	
4. Warfield[34]	55	54	..		1	..	Mother T. B. C. Neg. to 5 and 10 mg. T. O. subcutan.
	51	15	..	Reacted to 1 mg. T. O. subcutaneous.	36	..	
	1	1	..				
	1	..	..		1	..	
	6	3	..		3	..	
Total	181	91	50		90	50	

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70. Presse méd., Sept. 18, 1907.

71. Berl. klin. Wchnschr., March 16, 1908.

TABLE 5

CONJUNCTIVAL REACTIONS

POSITIVE TUBERCULAR

		Reaction.		Control	Reaction.		Control
Author.	cases.	Pos.	Per cent.	Diagnosis.	Neg.	Pr. ct.	Diagnosis.
1. MacLennan[27]	25	23	..		2		
2. Kohler[72]	169	161	51		8	49	
					..	4.7	8% + to 4% O. T. 41% + to 2% O. T.
3. Maillet[37]	4	4					
4. Plehn[29] (see article)	38	31	81.6		7	18.4	
5. Cohn[9]	86	60	2	3 not in terminal stage.	26	2	
6. Colzolari[73]	12	3	..		9		
7. Wolff[23]	20	14	70	18 adults, 2 children.	6	30	Early 2d stage tubercular.
8. Webster & Kilpatrick[25]	43	43					
9. Letulle[74]	75	72	..		3		
10. Grasset & Rumdand[75]	7	7			1		
	1						
11. Proff	13	13					
12. Smithies & Walker[36]	29	29	..	1 after 1 and 5 mg. T. O. 1 slight after 1 1 mg. T. O. 2 marked after 1mg. T. O. 1 after 1, 5 and 10 mg. T. O.			
13. Baldwin[3]	53	50	..		3	..	1 miliary tuberculin; 1 tuberculin treated.
14. Schenck & Seiffert[47]	28	27	..		1		
15. Lenhartz	37	33	..		4	..	4 tuberculin treated.
16. Citron[79]	31	25	..		6		
17. Eppenstein[62]	85	60	..		25		
18. Mentoux [26]	15	14	..		1		
19. Schroeder & Kaufmann[24]	48	43	..		5		
20. Franke & Ratjen	6	6					
21. Andeoud[76]	13	12	..		1		
22. Blumel-Clarus[77]	289	260	..		29		
23. Calmette, Breton, Petit, Painblan and other authors[80]	111	108	..		3		
24. Comby[78] (children)	62	62	..	Clinical and autopsy 4 +			
25. Bing[71]	6	3	50		3	50	
26. Citron[79]	36	70	81	+ without cachexia.	16	19	
	14	2	14.4	+ with cachexia....	12	85.6	
	15	14	93	+ not tubercular...	1	7	
27. Mentoux[26]	10	..	..	Children, 1st stage.	10		
28. Moro[8]	8	5	..	Percut. react. +7..	3	..	Percut. react.—1. Percut. react. —1. Percut. react.—3.
	12	12	..	Percut. react. 11 2d.			
	4	1	..	Percut. react. 1 3d.			
29. Heinemann[59] (1st, 2d, 3d)	25	20	..	1 case tubercular peritonitis, recovery; 1 case treated many months for cilat. lesion gave — reac: later.	..	..	3 cases init. hemorrhage.
	18	18	..				
	5	2	..		3		
30. Levi[22]	69	45	66		18	..	14 advanced; 4 not advanced or cachetic; 1 unilteral tuberculous kidney; 1 tubercular prostate; 1 T. B. C. knee.
Total	1,572	1,352	86		214	14	

TABLE 6

SUSPECTED TUBERCULAR

	No.	Reaction.		Control	Reaction.		Control
Author.	cases.	Pos.	Per cent.	Diagnosis.	Neg.	Pr. ct.	Diagnosis.
1. MacLennan[27]	12	9	..		3	..	Clin. 1 tubercular hip 2 yrs. +2 react.
	12	10	..		2	..	10 mg. T. O. subcutaneous.
	20	19	..		1	..	Anim. inoc. sacral abscess.
2. Kohler[72]	5	2	..				
	..	3	..				
3. Cohn[9]	32	23	..		9	..	Not all negative to subcutaneous.
4. Wolff[23]	64	20	39.2	14 child. 50 adults. 80 to subcut.	43	61.2	
5. Webster & Kilpatrick[25]	58	36	..	Phys. Ex. +........	18	18	Phys. ex. + .1 mg. O. T. bacilli in sputum 1 month previous. Phys. ex.?
	16	6	..	Phys. Ex.?.........	7	7	
6. Grasset & Rumdand[75]	5	5					
	3				3		
7. Proff	6	..	..		6	..	Babies born; tubercular mother.
8. Smithies & Walker[36]	6	6					
9. Baldwin[8]	26	8	..	Clinical	14	..	Clinical.
10. Schenck & Seiffert[47]	20	6	30	No positive physical findings.			No positive physical findings.
	..	6	30				
	..	3	15		5	25	
11. Lenhartz	63	23	..		40		
12. Citron[79]	14	11	..		3		
13. Eppenstein[62]	89	38	..		51		
14. Metraux	11	9	..		2		
15. Schroeder & Kaufmann[24]	9	4	..		5		
16. Franke & Ratjen	12	9	..		3		
17. Andeoud[76]	3	1	..		2		
18. Comby[78] (children)	70	..	..		70	..	Clinically, 6 autopsy.
19. Bing[71]	15	6	..		9		
19. Ctron[79]	18	10	55.5	Clinicl	8	44.5	
20. Mentoux[26]	3	3	..	Clinical			
21. Moro[3]	17	10	..	Percut. +16	7	..	Percut. react. —1.
22. Heinemann[59]	33	22	..		11		
Total	642	308	48		334	52	

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72. Deutsch. med. Wchnschr., 1907, No. 50.
73. Riforma medica., July 26, 1907.
74. Bull. Soc. d. hôp. de Paris, Aug. 31, 1907.
75. Bull. Soc. d. hôp. de Paris. Aug. 31, 1907.
76. Bull. méd. 1907, xi, No. 20.
77. Med. Klin., 1907, No. 50.
78. Presse méd., 1907, No. 10.
79. Sitz. d. Berl. med. Gesellsch., July 24, 1907; Deutsch. med. Wchnschr., Feb. 20, 1908.
80. Compt. rend. Acad. d. Sc., July 7; la Presse méd., July 13, 1907, No. 56.

TABLE 7

OTHER DISEASES NON-TUBERCULAR

Author.	No. cases.	Reaction. Pos.	Reaction. Per cent.	Control Diagnosis.	Reaction. Neg.	Reaction. Pr. ct.	Control Diagnosis.
1. MacLennan[27]	20	4	..		16		
2. Maillet[37]	4	4	..				
3. Plehn[29]	5	2	..	Typhoid, acute articular rheumatism, acute bronchitis, scarlet fever, enteritis, pleurisy and pregnancy, rheumatism, reaction reappeared with return of rheumatism.	3		Typhoid, acute articular rheumatism, acute bronchitis, scarlet fever, pleuritis and pregnancy two weeks later.
	12	6	..		6		
	6	3	..		3		
	5	2	..		3		
	3	3	..				
	1	1	..		1		
	1	1	..				
4. Cohn[9]	192	10	..		182		
5. Calzolari[73]	19	..	..		19		
6. Letulle[74]	50	19	..		31		
7. Grasset & Rumdand[75]	14	..	..		14		
	1	1	..				
8. Smithies & Walker[36]	136	10	..		126		
9. Baldwin[8]	57	16	..	Clinical	41	..	Clinical.
10. Schenck & Seiffert[47]	52	3	57				
	..	11	22		26		Clinical.
	..	12	23	Clinical			
11. Citron[79]	45	1	..		44		
12. Eppenstein[62]	13	4	..		9		
13. Mentoux[26]	42	2	..		40		
14 Schroeder & Kaufmann[24]	20	12	..		8		
15. Franke & Ratjen	33	4	..		29		
16. Andeoud[76]	15	..	..		15		
17. Calmette, Breton, Painblan, Petit and other French authors[50]	87	1	..		86		
18. Moro[3]	25	6	..	Per cut. + 8	19		
19. Heinemann[59]	63	10	..		53		
Total	932	152	17		779	83	

TABLE 8

CLINICALLY NORMAL INDIVIDUALS

Author.	No. cases.	Reaction. Pos.	Reaction. Per cent.	Control Diagnosis.	Reaction. Neg.	Reaction. Pr. ct.	Control Diagnosis.
1. Maillet[33]	15	..	..		15		
2. Webster & Kilpatrick[25]	4	2	..		2		
3. Proff	17	..	..		17		
4. Smithies & Walker[36]	76	2	..		74		
5. Baldwin[8]	47	16	..	Not all physicians' findings	30		One reacted to a 2 per cent. solution which had been —to 10 mg. T. 0.
6. Bing[71]	79	1	1.2		78	98.8	
7. Citron[79]	100	6	6	Clinical	..	...	
8. Mentoux[26]	13	13	..	Clinical	..	...	
Total	351	40	11		311	89	

TABLE 9

TABLE OF SCHROEDER AND KAUFMANN

Author.	Positive Tuberculosis. No.	Positive Tuberculosis. Pos.	Positive Tuberculosis. Neg.	Suspected Tuberculosis. No.	Suspected Tuberculosis. Pos.	Suspected Tuberculosis. Neg.	Non-Tuberculous. No.	Non-Tuberculous. Pos.	Non-Tuberculous. Neg.
Lenhartz	38	33	4	63	23	40	11	4	7
Cohn	86	60	26	3	23	9	192	10	182
Citron	31	25	6	14	11	3	45	1	44
Kohler	169	161	8	5	5	..	..	..	..
Eppenstein	85	60	25	89	38	51	13	4	69
Baldwin	53	50	3	26	8	18	57	16	41
Metraux	15	14	1	11	9	2	42	2	40
Schenck-Seyffert	28	27	1	20	15	5	52	26	26
Andeoud	13	12	1	3	1	2	15	..	15
BlumelClarus	289	260	29	..	..	..	..	..	..
Calmette u. a. franz. authors	111	108	3	..	..	..	87	1	86
Schroeder-Kaufmann	48	43	5	9	4	5	20	12	8
							(Nor) 18	12	6
Franke-Ratjen	6	6	..	12	9	3	33	4	29
Total	971	859	112	284	146	138	627	80	547
Per cent.		88.5	11.5		51.4	48.6		12.7	87.3

TABLE 10

CASES OF ENGELBACH AND SHANKLAND

POSITIVE TUBERCULOSIS

	Positive No.	Positive Per cent.	Negative No.	Negative Per cent.	Total.
Cutaneous	31	56.4	24	43.6	55
Conjunctival	52	74.3	18	25.7	70
Total	83	66.4	42	33.6	125

TABLE 11

SUSPECTED TUBERCULOSIS (OTHER THAN PULMONARY.)

	Positive No.	Positive Per cent.	Negative No.	Negative Per cent.	Total.
Cutaneous	30	55	25	45	55
Conjunctival	21	52.5	19	47.5	40
Total	51	54	44	46	95

TABLE 12

CLINICALLY PULMONARY TUBERCULOSIS

	Positive No.	Positive Per cent.	Negative No.	Negative Per cent.	Total.
Cutaneous	28	66.66	14	33.3	42
Conjunctival	15	28	38	72	53
Total	43	47	52	53	95

TABLE 13

OTHER DISEASES NON-TUBERCULOUS CLINICALLY

	Positive No.	Positive Per cent.	Negative No.	Negative Per cent.	Total.
Cutaneous	149	56.5	119	43.5	268
Conjunctival	102	24.4	315	75.6	417
Total	251	36.6	434	63.4	685

TABLE 14

CLINICALLY NORMAL INDIVIDUALS

	Positive No.	Positive P.C.	Negative No.	Negative P.C.	Doubtful No.	Doubtful P.C.	Total.
Cutaneous	41	51	18	22.8	20	25.3	79
Conjunctival	18	25.5	46	65.8	6	8.6	70
Total	59	38	64	44.3	26	16.9	149

negative conjunctival reaction 67 days previous to death. One gave positive reactions to both tests 73 days before death.

From the above we conclude that in known tuberculosis the kind of reaction has no bearing on the prognosis of the case. Positive reactions have occurred with us as early as one day before death; both reactions have been present in variable percentage as long as three months previous to death. The negative reactions have practically equaled the positive reactions in occurrence two or three months previous to death.

UNTOWARD EFFECTS OF THE CONJUNCTIVAL REACTION

The evidence of accumulating cases has unquestionably proven that the conjunctival instillation of tuberculin is not entirely free from danger. On the contrary, from the following report one must conclude that there is a liability of producing severe inflammatory processes in normal eyes, of aggravating non-tuberculous affections of the eye, and of producing an extension, and in some cases a rapidly destructive process, in tuberculous affections of the eye, from its use. McKay[61] reports a severe conjunctivitis lasting over ten weeks in an eye that was normal previous to the instillation of a 1 per cent. solution. Eppenstein[62] reports three cases of conjunctival phlyctenular keratitis which were greatly exaggerated, and says that chronic hyperemia, blepharitis or conjunctivitis of any kind contraindicates its use.

Ferrien[63] reports a conjunctivitis lasting two months, which terminated by having the aspects of tuberculosis of the conjunctiva. Babier and Renon[64] have observed conjunctivitis persist for one or two months. Stevenson reported three cases of follicular conjunctivitis which existed from 20 to 40 days. Kalt[65] reports serious results in iritis, sclerokeratitis and iridochorioiditis. Trousseau[66] reports a marked extension of a tubercle of the conjunctiva immediately following the instillation of a 0.5 per cent. of tuberculin. In another case a tuberculous iritis was greatly aggravated, although the reaction was negative. Babier[64] reports keratitis and ulceration of the cornea from a conjunctival reaction. A large majority of other authors, not oculists, have observed more or less unfavorable results varying in degree and severity from this test.

Besides these local untoward reactions Wolff[23] observed a very marked febrile reaction in the conjunctival test. Wolff-Eisner[57] and many others obtained general reactions. Proff noted that the tuberculo-opsonic index was modified by these reactions, and that in some cases the negative phase was marked and unusually prolonged.

We wish to take this opportunity of expressing to senior house physicians, Dr. R. Bunch and Dr. F. Esselbruegge our appreciation for services rendered us in the preparation of this article.

CONCLUSIONS

The diagnostic value of these reactions in adults is restricted to many limitations:

1. The specificity of these reactions have as yet not been demonstrated.
2. The activity or extent of the lesion bears no definite relation to the degree or kind of reaction.
3. The conjunctival reaction is not free from danger.

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[61] Boston Med. and Surg. Jour., March 12, 1908.
[62] Med. Klin., Sept. 8, 1907.
[63] Bull. Soc. d'Ophth. de Paris, Oct. 8, 1907.
[64] Bull. et mém. Soc. d. hôpitaux de Paris, Dec. 12, 1907.
[65] Bull. Soc. d'Ophth. de Paris, Oct. 8, 1907.
[66] Jour. de méd. et de Chir., Jan. 10, 1908.

THE CONDITION OF THE PERIPHERAL BLOOD VESSELS IN SHOCK *

M. G. SEELIG, M.D. AND E. P. LYON, PH.D.
ST. LOUIS

From a purely historical point of view the literature devoted to shock may be divided into three periods: 1, From 1795, when the word shock was first used as we now use it, down to the beginning of the era of experimentation in 1870; 2, the period from 1870 to 1885, devoted to careful experimental investigations; and, 3, from the reopening of the question by Crile in 1889 down to the present time. From 1885 to 1889 practically no papers other than purely casuistic ones appeared on the subject.

THEORIES IN REGARD TO SHOCK

The excellent summary published by Mansell Moullin[1] in 1882, and the encyclopedic volume contributed to the subject by Groeningen[2] in 1885 render it unnecessary to restate the historical development of the theme. It is of more than passing interest, however, to note that those views regarding shock which are most commonly accepted to-day differ but little from opinions published nearly half a century ago. It does not seem to be known generally that as early as 1864 W. W. Keen, S. Weir Mitchell and G. R. Morehouse[3] enunciated practically the same theory as that put forward by Crile nearly forty years later. I have been able to find only one reference to this work by Keen, Mitchell and Morehouse, and that reference was in a German monograph. The experimental work of Fischer[4] in 1870 confirmed the theory proposed by Keen, Mitchell and Morehouse, and set on a fairly firm basis the idea that shock was due to vasomotor exhaustion. Leyden,[5] however, took issue with Fischer and announced his belief to be that shock was due to a reflex inhibition of the activity of the centers of the cord. Meltzer,[6] in the most recent paper contributed to the shock question, practically coincides with the theory of Leyden. The theory recently expounded by Boise,[7] that cardiac exhaustion is the main underlying factor in shock, is a reiteration of the conclusion of Blum[8] published in the seventies.

It is in no disparaging sense that we emphasize the fashion in which old views have been rehabilitated. Indeed, we feel that every contribution that we have mentioned has been of of importance. Crile's[9] work, for example, furnishes the most comprehensive data ever contributed to the shock problem and has been instrumental in starting anew investigations as to the cause of one of the most dreaded surgical complications. Our purpose is rather to express agreement with Meltzer, when he says that despite all theorizing and experimentation, "the bringing forward of new experimental facts capable of shedding some more light on our puzzling problem is not yet a superfluous luxury."

Meltzer, in his paper, points out the fact that Crile fails to draw a distinction between surgical shock, with

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* An Experimental Study from the Physiological Laboratory of St. Louis University Medical School.

[1] Mansell Moullin, C. W.: International Encyclopedia of Surgery, London, 1882.
[2] Groeningen, G. H.: Ueber den Shock. Weisbaden, 1885.
[3] Circular No. 6. Surgeon-General's Office, 1864.
[4] Fischer, H.: Samml. klin. Vortr. (Volkmann's), 1870, No. 10.
[5] Leyden, E.: Samml. klin. Vortr. (Volkmann's), 1870, No. 2.
[6] Meltzer, S. J.: The Nature of Shock, Arch. Int. Med., July, 1908, i, 571.
[7] Boise, E.: Am. Jour. Obst., 1907; Tr. Am. Gynec. Assn., 1908.
[8] Blum, A.: Arch. gén. de méd. de Paris, January, 1876.
[9] Crile, G. W.: Blood Pressure in Surgery, Philadelphia, 1903; An Experimental Inquiry into Surgical Shock, Philadelphia, 1899.